

1 1) A system for recognizing a particular pattern formed by a plurality of bytes in a
2 stream of bytes, said system operating in a series of states, and said system
3 including:

4 a plurality of look up tables, one for each of said plurality of bytes, each look
5 up table having a section associated with each state, ;
6 a first index table which has index data associated with each state, the index
7 data associated with each state comprising a plurality of index bits, ; and
8 a next state table which has a data word associated with each state, each
9 data word having data that specifies the next state and/or a special
10 flag,

11 said system performing the following steps in each particular state of a series of
12 states, ;

13 a) interrogating a particular section of each lookup table utilizing the value of
14 the associated bytes to determine the value of a series of bits, said
15 particular section of each lookup table being determined by the
16 particular state, ;
17 b) generating a pointer from a combination of the value of the series of bits
18 determined by said lookup tables and the bits in current state location
19 in said first index table, said pointer specifying the address of a
20 particular data word in said next state table, ;
21 c) reading the particular data word specified by the pointer generated in step
22 “b” and based on the contents of said data word proceeding to the
23 next state specified by said data word and/or performing special
24 operations in response to said flag, ; and
25 d) repeating steps “a”, “b” and “c” until an end of operation is indicated by
26 said flag.

27
28 2) The system recited in table 1 wherein all of said plurality of bytes are used to
29 interrogate said look up tables in parallel.

1 3) The system recited in claim 1 wherein those bytes that cause the same transition
2 are grouped into classes whereby multiple bytes can be represented by a single
3 class, each class having a single entry in any particular single section of said table.

4
5 4) The system recited in claim 1 wherein at each state, each look up table
6 generates a series of bits, the particular series of bits generated being dependent
7 upon the particular value of the associated byte.

8
9 5) The system recited in claim 4 wherein said look up tables generate a variable
10 number of bits depending upon the particular state of operation.

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12 6) The system recited in claim 3 wherein the bits generated by any look up table
13 depends upon the number of character classes of the associated byte.

14
15 7) The system recited in claim 4 wherein the bits generated by said plurality of look
16 up tables are concatenated together and then concatenated with said value from
17 said first index table.

18
19 8) The system recited in claim 4 wherein the bits generated by said plurality of look
20 up tables and said value from said first index table are combined to form the
21 address of a location in said next state table.

22
23 9) The system recited in claim 1 wherein said data stream comprises a stream of
24 bytes that form a data packet, said particular operation is the recognition of a
25 particular pattern of bytes in a data packet and wherein a signal is given when said
26 pattern is recognized.

27
28 10) The system recited in claim 9 wherein when a particular pattern of bytes is
29 recognized, said operation continues to another state to find another occurrence of
30 said pattern of bytes in said packet.

1
2 11) The method of recognizing a particular pattern formed by a plurality of bytes in
3 stream of bytes, said method operating in a series of states, and utilizing:

4 a plurality of look up tables, one for each of said plurality of bytes, each look
5 up table having a section associated with each state,
6 a first index table for storing a plurality of index bits associated with each
7 particular state, and
8 a next state table for storing data words, each of which indicates the next
9 state and/or a special operation flag,

10 said method including the following steps in each particular state in a series of
11 states,
12 a) interrogating a particular section of each lookup table utilizing the value of
13 the associated byte to determine the value of a series of bits, said
14 particular section of each look up table being based on the particular
15 state,
16 b) generating a pointer which specifies the address of a data word in said
17 next state table from a combination of the selected values from the
18 lookup tables and a value from the first index table associated with
19 the particular state,
20 c) reading the particular data work specified in step "b" and based on the
21 contents of said data word proceeding to the next state and/or
22 performing operations indicated by a flag in said data work, and
23 d) repeating steps "a", "b" and "c" until a flag in said next state table
24 indicates an end of the operation.

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26 12) The method recited in claim 11 wherein all of said plurality of bytes are matched
27 with data in said look up tables in parallel.

28
29 13) The method recited in claim 11 wherein those bytes that cause the same
30 transition are grouped into classes whereby multiple bytes can be represented by a

1 single class, each class having a single entry in a section of said table.

2

3 14) The method recited in claim 11 wherein at each state, each look up table
4 generates a series of bits, the particular series of bits generated being dependent
5 upon the particular value of the associated byte.

6

7 15) The method recited in claim 14 wherein said tables generate a variable number
8 of bits depending upon the particular state of operation.

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10 16) The method recited in claim 11 wherein the bits generated by any look up table
11 depends upon the class of the associated byte.

12

13 17) The method recited in claim 14 wherein the bits generated by said plurality of
14 look up tables are concatenated together and then concatenated with said value
15 from said first index table.

16

17 18) The method recited in claim 11 wherein said classes are a compressed
18 representation of the alphabet used in said state machine.

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20 19) The system recited in claim 1 wherein the series of bits generated by each look
21 up table has a number of bits that can vary from state to state.

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23 20) The method recited in claim 11 wherein the series of bits generated by each
24 look up table has a number of bits that can vary from state to state.

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26 21) The system recited in claim 1 wherein said system includes four look up tables.

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28 22) The system recited in claim 1 wherein each of said tables has 256 entries for
29 each state.

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1 23) The system recited in claim 1 wherein said system includes a number of look
2 up table which is a multiple of four.

3

4 24) The system recited in claim 1 wherein each of said look up tables has a
5 number of entries equal to the values in the alphabet used by said bytes.

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7 25 An integrated circuit for recognizing a plurality of characters in parallel, said
8 integrated circuit operating in series of states, and said integrated circuit including
9 a plurality of look up tables, one for each of said characters, each look up
10 table having a section associated with each state, ;
11 an index table for storing a plurality of index bits for each state, and
12 a next state table for storing data words, each of which indicates the next
13 state of said state machine,

14 said integrated circuit performing the following steps in a plurality of particular
15 states, ;

16 a) interrogating the section of said look up table associated with said
17 particular state and generating a series of bits based on the value of
18 the associated character, ;

19 b) generating a pointer which specifies the address of a data word in said
20 next state table from a combination of the selected values from the
21 lookup tables and a value from said first index table, ;

22 c) reading the particular data word specified in step "b" and proceeding to the
23 state specified by said data word, and

24 d) repeating steps "a" , "b" and "c" until said operation ends.

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26 26) The integrated circuit recited in claim 25 wherein the number of bits generated
27 by said look up tables and the number of bits in the value from said current state
28 table vary by state, and the total number of bits is the same in all states.

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1 27) The integrated circuit recited in claim 25 wherein there are four look up tables
2 and four characters are evaluated in parallel.
3
4 28) A method for evaluating in parallel a plurality of characters in a stream of bytes,
5 said method operating in a series of states and utilizing a set of alphabet
6 lookup tables, one lookup table for each of said plurality of characters, each
7 look up table having a section associated with each of said states, and a
8 next state table, said method comprising:
9 a) selecting an alphabet lookup table from said set of alphabet tables, as a
10 function of a current state and byte position within said set of bytes,
11 and obtaining a class code from said selected alphabet table
12 corresponding to the character represented by said byte;
13 b) selecting a value from said next state table as a function of the current
14 state, and generating an indication of the next state from said class
15 codes of said set of bytes and from said value from said next state
16 table; and
17 c) repeating steps "a" and "b" until said state machine arrives at acceptance
18 state or until entering a failure state.
19

1 29) A system for recognizing a particular pattern formed by a number of bytes in a
2 stream of bytes, said number being at least one, said system operating in a
3 series of states, and said system including :

4 a look up table for each byte in said number of bytes, each look up table
5 having a section associated with each state ;
6 a first index table which has index data associated with each state, the index
7 data associated with each state comprising a plurality of index bits ;
8 and
9 a next state table which has a data word associated with each state, each
10 data word having data that specifies the next state and/or a special
11 flag,

12 said system performing the following steps in each particular state of a series of
13 states ;

14 a) interrogating a particular section of each lookup table utilizing the value of
15 each of said bytes to determine the value of a series of bits, said
16 particular section of each lookup table being determined by the
17 particular state ;

18 b) generating a pointer from a combination of the series of bits generated by
19 the lookup tables and bits in the current state location in said first
20 index table, said pointer specifying the address of a particular data
21 word in said next state table ;

22 c) reading the particular data word specified by the pointer generated in step
23 “b” and based on the contents of said data word proceeding to the
24 next state specified by said data word and/or performing special
25 operations in response to said flag ; and

26 d) repeating steps “a”, “b” and “c” until an end of operation is indicated by
27 said flag.

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1 30) The system recited in claim 1 wherein said system includes a mask with one bit
2 for each of said plurality of bytes in a data packet, and said steps including
3 an initial step of selecting bits for processing utilizing said mask.
4
5 31) The method recited in claim 10 wherein said method utilizes a mask with one
6 bit for each of said plurality of bytes in a data packet, and said steps
7 including an initial step of selecting bits for processing utilizing said mask.